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ABSTRACT

This paper discusses the link between student college learning and work skills within the context of National Educational Goals 3.2 and 5.5. which address general and advanced reasoning and communication skills. It considers how colleges identify workplace needs, how colleges use that information as well as the assessment of college learning from a national perspective. Results from one study are reported which suggests that the assessment of abilities involved in work and citizenship roles can be collected directly from college graduates if the abilities are defined and assessed in ways that connect education and work. Three key elements are identified for such an assessment on a national level. First, agreement must be reached on the set of higher order thinking and communications skills that contribute to success in the workplace and in citizenship. Second, an acceptable means must be developed of assessing the teaching/learning of these skills which is reliable, valid, and cost-effective. Third, the assessment process should be pro-active, in that it must identify incentives for or barriers to learning and disseminate the information back to the community for use in enhancement of the teaching/learning process. Difficulties and considerations in achieving and measuring school/college/work relationships are discussed. Attached are a listing of papers available from ERIC on postsedondary student assessment. (GLR)

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Comments prepared for Delivery at the Assessment Forum 1992 on the Link Between College Learning and the World of Work from a National Goals Perspective. S. Corrallo, June 10, 1992

Over the past few years a great deal of the attention has been given to the deficiencies in elementary-secondary education largely in response to reports from the National Assessment of Educational Progress[1]. Additionally, a lack of effective workplace skills for recent high schools graduates entering the workforce was documented in reports commissioned by the Secretary's Commission for Achieving Necessary Skills (SCANS) of the Department of Labor.[2] SCANS noted that this deficiency has required massive retraining efforts by a number of large firms most notably IBM, AT&T and Motorola. In a like vein, the remedial education needs of students entering college has also been on the increase. The number of colleges offering support services specifically for students needing remediation increased from 90 percent in 1983-84 to 100 percent in 1989-90.[3]

Concern with the quality of the college experience has only recently been considered a potential problem. Historically few

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[1] Educational Testing Service, "Trends in Academic Progress: Achievement of American Students in Science, 1970-90, Mathematics, 1973-90, Reading, 1971-90, and Writing, 1984-90" Compiled by Gene Owen of the National Center for Education Statistics, September 1991.

[2] The Secretary's Commission on Achieving Necessary Skills, Learning a Living: A Blueprint for High Performance Us Department of Labor, Washington, D.C., April 1992.

[3] National Center for Education Statistics, College-Level Remedial Education in the Fall of 1989, Survey Report, U.S. Department of Education, Washington,D.C., May 1991. NCEC 91-191.

educators, at the college level, have been concerned with assessing the use or application of the learning experiences or abilities of college graduates. It has been assumed that the successful completion of college provides sufficient learning for credentialing or licensing when necessary. For example nursing, physical therapy, and accounting, etc.,entrance to graduate schools and in the case of community college students, to four year colleges. The increased attendance at the Assessment Forum alone is proof enough that assessment of college student learning has become very serious business at the institutional level. A recent survey by the Educational Commission of the States (ECS) indicated a similar interest at the state level[4]. And with the adaption of the National Goals for Education, there is now national attention on the assessment of college student learning.

National Educational Goals 3.2 and 5.5 suggest that the Governors and the President have heard voices on the need to improve application of higher order thinking and communication skills in the workplace and every day life. There is concern that graduates of our institutions at all levels have the skills they will need for success in their professional and personal life experiences. Goal 3.2 reads

> "The percentage of students who demonstrate the ability to reason, solve problems, apply knowledge, and write and communicate effectively will increase substantially."

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[4] Christine P. Paulson, State Initiatives in Assessment and Outcomes Measurement, Denver CVO, Educational Commission of the States, 1990.

While Goal 5.5 reads

> "The proportion of college graduates who demonstrate an advanced ability to think critically, communicate effectively, and solve problems will increase substantially."

The National Center for Educational Statistics has been charged with identifying an approach(es) to assessing the attainment of these skills in college graduates. In November of last year, as the first step toward the development of a means of assessing the attainment of these skills, a study design conference was held in Washington. The paper Dr. Mentkowski presented today, was based upon remarks she prepared for that meeting. It was one of fifteen papers. An "Announcement" on the papers and how they may be secured is attached to the written comments. Dr. Mentkowski's paper was the only one to provide a hands on account of skills development and their use from an undergraduate/work viewpoint. She was asked to explore how the link between college learning and work skills are developed, how colleges identify workplace needs and colleges use that information. My comments focus primarily upon the college-work links and the assessment of college learning from a national perspective.[5]

As indicated in her presentation, based upon the Alverno College

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[5] The paper was commissioned by the Department of Education as part of the preparation for a study design conference that identified the issues and concerns around the development of a process(es) to assess the higher order thinking and communication skills of college graduates in support of National Goal 5.5. Copies of all papers and reviews are available form the Department of Education as noted in the "Announcement".

experience, Dr Mentkowski feels strongly that college learned or developed abilities, or the application of these skills, can be assessed in ways that enable judgments of graduates' workplace effectiveness. The assessment of abilities involved in work and citizenship roles can be collected directly from college graduates if the abilities are defined and assessed in ways that connect education and work. Armed with this knowledge, faculty and students and employers and employees can use the information to improve instruction or training and to determine how they are meeting their own and others' expectations for learning outcomes and work performance. She feels strongly that both an accountability and improvement agenda can be met with the same assessment system. These are encouraging comments at least in terms of connecting what goes on in the classroom and in the workplace at the institutional level.

Dr. Mentkowski's Paper was reviewed by three readers. They were asked to view her comments from the perspective of a national assessment. They highlighted some of the problems that her paper identified that will have to be overcome in the design and development of a national assessment process. Swanson[6] was concerned that the potential size of the assessment exercise, were this model to be used at the larger institution level may make it unworkable. He suggested that the scope of the assessment be more narrow. Instead linking the higher order thinking skills to specific workplace skills, he would strive for the improvement of

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[6] See "Announcement" under Mentkowski for reference.

the thinking skills in general, which in his opinion, would defacto improve the use of skills on the job and elsewhere. It also gets around the problem of defining citizenship. He also suggests that the assessment, because of costs and complexity, will have to be summative, and based upon a sample. As a result it is unlikely that it will have the information that can be feed back to the educational sector to improve the teaching/learning of these skills.

Larson[7] felt that the principles of assessment outlined in the paper deserve the consideration of any individual or group interested in educational reform. However he too had several concerns. In contrast to Larson, he felt there is need to differentiate between knowledge and ability within a discipline. Can one, for example, do critical thinking in mathematics without a requisite knowledge in mathematics? He also felt that more research evidence will have to be presented to support improved performance, the transfer of abilities, and validation of performance assessment. He also questions how a dynamic system, as evidenced by the high rate of change of technology in today's world, may be assessed. Can a baseline be established? How can you be sure that the measures assess what they were designed to measure? Although generally laudatory, he questions whether, the Alverno experience may have limitations from a national perspective; can one model can fit all. Larson also questions how national values are to be judged. He called for additional

[7] See "Announcement" under Mentkowski for reference.

research on assessment process. In particular "when ratings on assessment center performance are factor analyzed, the resultant factors represent performance on specific exercises, not the cross-exercise abilities or other constructs that the total assessment center was designed to measure".

As we consider how to make the link between the college experience and post college responsibilities there are other activities and sources of information to be considered. One of the other workshop authors, Peter Capelli of the Wharton School of Business, focused upon what can be learned by the use of job analysis techniques. In this instance, a job is broken down into functions and the skills and competencies needed to perform that job are identified. They go a step farther in that they identify varying levels of job difficulty, changes not in the basic thrust of the position but in the need for higher level of skills as responsibilities or techniques change. Addition insights, for this project on how to establish the links between these two worlds can be gained the work going on related to the granting of college credits for work experiences. In this instance it is assumed that workplace experiences develop the skills and competencies one would have developed through classroom participation. Thus for some people rather than bringing skills with them they are developed on the job.

It looks like we may have another chicken and the egg mystery. There may be no clear cut answer to this question. For example on

cutting edge technologies, learning and training must necessarily take place at the development site; a laboratory or on the job itself. Later the training and learning requirements are transferred to the classroom. There are numerous examples of this in recent years as evidenced by new degree programs in computer technology. bio-engineering and environmental studies. Perhaps the real question is what does it take to provide the graduate with the skills and competencies to develop needed both to master existing as well as new technologies. What skills and competencies do we need in our graduates that will prepare them for the dynamic world in which they will live and work? It appears to be another chapter in the age old argument of general versus specialized education. To add more complexity to the issue, the literature, according to Peter Cappelli in another recent paper, "Is the 'Skills Gap' Really About Attitudes" published by the National Center on Educational Quality of the Workforce, in October 1991, is mixed on the value of specific job-related skills versus general socialized norms required for the workplace. More work, he suggests, will be required to place the teaching of these skills and norms in perspective.

These comments point out the complexity of the exercise at hand. They suggest that few assumptions can be made and there are a number of areas that will need further research. Work shop participants, essentially suggested that we start at the beginning. They identified three key elements or tasks necessary for this goal to be achieved. First agreement must be reached on the set of

higher order thinking and communications skills, both from a general and discipline specific context, that contribute to success in the workplace and in the practice of citizenship. Second an acceptable means must be developed to assess the teaching/learning of these skills which is reliable, valid, and cost-effective. Third the assessment process should be pro-active, in that it must identify incentives for or barriers to learning and disseminate the information back to the community for use in enhancement of the teaching/learning process. We consider these tasks to be sequential. Initially we plan to focus only upon the first task. It is considered a major effort. We need to understand what users are looking for in graduates and then what institutions are doing to enhance the attainment of these skills. We must also understand the implications of the school\college\work relationships as we define these skills and levels of proficiency. A two year effort is planned beginning with the awarding of a contract to start in January of 1993. But getting this agreement may be easier said then done. Howard Gardner noted his concern in the Chronicle of Higher Education, in a piece on the process to identify and get agreement on goals and standards within the educational community, [8]. He writes:

> " For a community (all of those concerned with education) to be viable, it members must work together over time to develop reasonable goals and standards, work out the means for

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[8] Howard Gardner, The Rhetorics of School Reform: Complex Theories vs. the Quick Fix, Chronicle of Higher Education, May 6, 1992.

achieving such goals, have mechanisms to check whether progress is being made, and develop methods for changing course-sometimes dramatically-if progress is not being achieved. In a viable community, members recognize their differences and strive to be tolerant, while learning to talk constructively with one another and perennially searching for common ground."..." But as long as the rhetorics about school reform remain widely divergent, little progress is likely. An important, if not decisive, step will have been taken when educational experts and opinion leaders come to speak of-and think about-school reform in terms of the same images. Then perhaps they can forge solutions superior to those that either group could forge on its own."

This is the charge and perhaps the worry. The teaching/learning of most skills are generally considered to be cumulative, crossing grade and discipline levels. This suggests that these needs to be closer articulation in the identification, definition, and the standards used to identify levels of attainment or proficiency of these skills across all grade levels. This is not a radical or unworkable idea. A number of states and local education agencies have recognized that learning is cumulative and have developed definitions of proficiency from basic to advanced levels. New York State[9] and the Ft. Worth School System (Exhibit 2) are two examples. The Ft. Worth example which suggests that achieving a

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[9] New York State Education Department, "Basic and Expanded Skills: Scales for Validation Study", Albany, New York, July 1990.

level of proficiency for a given skill is not bound by grade level. Secondary students may be expected to achieve the second or third levels. On the other hand, a student at the college level may not master a level of proficiency in writing as high as some high school graduates.

Ironically although there are many state and institutional efforts underway and there is need for co-operation among the elementary-secondary and postsecondary levels, the larger concern for the lack of co-operation and commonality in definition and purpose may be at the Federal level. As one might expect there is a great deal of interest in this project within the Department of Education and over a number of Federal agencies. A number of efforts are currently underway that relate either directly or indirectly to Goal 5.5. First there is the effort we are reporting on. A summary of that project is outlined in Table 1. We expect to enter the first phase early next year. it will focus upon the identification of skills and levels of proficiency and various approaches to assessing these skills. Second, as a followup to the SCANS effort, cited above, there is a joint effort between the Departments of Labor and Education as it relates to workplace skills. Table 2 outlines this project. It is concerned with the identification of methods that may be used to assess the workplace competencies identified by the commission (Exhibit 1). There is also a plan to test the reliability of the Graduate Record Examination as a means of assessing college student learning. The postsecondary unit in NCES is currently trying to figure out how to

get college graduates who do not plan to attend graduate school to take the test. This of course will be a problem with any assessment instrument. Fourth, the National Assessment for Educational Progress, is looking into the development of test items for cognitive skills as part of its larger survey efforts. This activity is especially important for Goal 3.2, but the definitions and levels of proficiency used are also important to the Goal 5.5 postsecondary assessment project. Outside of the Department, there is also an interest in the assessment of higher order thinking and communication skills in the National Science Foundation, the National Endowment for the Humanities, and the Office of Personnel Management. Representatives from all of these studies and agencies were invited to participate in the earlier workshop and will be invited to participate future Goal 5.5 study activities.

The fact that Alverno has been able to link student learning and faculty teaching with the world of work suggests some form of national assessment is possible. The need to keep this process open, thoughtful, and participatory during all stages of the process, is acknowledged. For as I keep reminding people, the goal is to improve the teaching/learning of these skills. Assessment only one tool or steps of several needed to achieve that goal. Further it must be remembered that teaching/learning starts and ends in the classroom.

ANNOUNCEMENT

U.S. Department of Education ● Office of Educational Research and Improvement

ERIC & National Center for Education Statistics

New Papers on Postsecondary Student Assessment Available from ERIC

In 1990, the National Education Goals Panel established long term objectives to guide America towards educational excellence. National Education Goal five states that by the year 2000:

> "Every adult American will be literate and will possess the knowledge and skills necessary to compete in a global economy and exercise the rights and responsibilities of citizenship."

Five objectives are listed under the goal, one of which is directed at college student learning. Objective five reads:

> "The proportion of college graduates who demonstrate an advanced ability to think critically, communicate effectively, and solve problems will increase substantially."

In order to track student progress toward reaching the goal/objective, a strategy for assessing these skills must be identified. In the summer of 1991, the National Center for Education Statistics initiated the study design phase of this process by commissioning fifteen position papers on the subject. Academic researchers, practitioners, and policymakers offered their viewpoints on the issues and provided supporting evidence for their stance.

The authors addressed four basic questions:

- How should the skills be defined?
- For each skill, what levels of proficiency should be set?
- How should the skills be assessed?
- Finally, who should be assessed and when?

Three experts involved in some aspect of college student learning and assessment reviewed each paper and provided additional input into the process.

Representatives of the higher education community concerned with student learning and assessment will find these papers to be a valuable addition to the limited information currently available on the subject. State and institutional researchers and policymakers charged with the development of assessment systems will also discover the contents to be enlightening and useful.

The papers will be abstracted in the May 1992 issue of *Resources in Education (RIE)*. Copies of each paper and the related reviews may be obtained through the ERIC Document Reproduction Service (see below). When ordering, please use the ERIC identification numbers provided for each item.

Trudy Banta, University of Tennessee at Knoxville: *Toward a Plan for Using National Assessment to Ensure Continuous Improvement of Higher Education.* (TM018009)

> Reviewed by: Nancy Beck, Educational Testing Service; Norman Frederiksen, Educational Testing Service; Barbara Wright and Ted Marchese, AAHE Assessment Forum

Peter Capelli, University of Pennsylvania: *Assessing College Education: What Can be Learned from Practices in Industry.* (TM018010)

> Reviewed by: Elinor M. Greenberg, EMG Associates; Margaret A. Miller, Virginia State Council of Higher Education; Mary L. Tenopyr, AT&T

Steven Dunbar, University of Iowa: *On the Development of a National Assessment of College Student Learning: Measurement Policy and Practice in Perspective.* (TM018011)

> Reviewed by: John Chaffee, LaGuardia Community College; Norman Frederiksen, Educational Testing Service; Ronald Hambleton, University of Massachusetts

Peter Ewell and Dennis Jones, National Center for Higher Education Management Systems: *Actions Matter: The Case for Indirect Measures in Assessing Higher Education's Progress on the National Education Goals.* (TM019012)

-more-

Reviewed by: Robert Calfee, Stanford University; Elinor M. Greenberg, EMG Associates; Mary L. Tenopyr, AT&T

Charles S. Lenth, State Higher Education Executive Officers: *The Context and Policy Requisites of National Postsecondary Assessment.* (TM018013)

Reviewed by: Robert Calfee, Stanford University; Richard Larson, Lehman College; Ronald Swanson, Texas Higher Ed Coordinating Board

Georgine Loacker, Alverno College: *Designing a National Assessment System: Alverno's Institutional Perspective.* (TM018014)

Reviewed by: Elinor M. Greenberg, EMG Associates; Margaret A. Miller, Virginia State Council of Higher Education; Mary L. Tenopyr, AT&T

Marcia Mentkowski, Alverno College: *Designing a National Assessment System: Assessing Abilities that Connect Education and Work.* (TM018015)

Reviewed by: Richard Larson, Lehman College; Ted Marchese and Barbara Wright, AAHE Assessment Forum; Ronald Swanson, Texas Higher Education Coordinating Board

Ed Morante, College of the Desert: *General Intellectual Skills (GIS) Assessment in New Jersey.* (TM018016)

Reviewed by: Richard Larson, Lehman College; Michael Scriven, Pacific Graduate School of Psychology; Ronald Swanson, Texas Higher Education Coordinating Board

Susan Nummedal, California State University at Long Beach: *Designing a Process to Assess Higher Order Thinking and Communication Skills in College Graduates: Issues of Concern.* (TM018017)

Reviewed by: John Chaffee, LaGuardia Community College; Peter A. Facione, Santa Clara University; Ronald Hambleton, University of Massachusetts

Richard Paul and Gerald Nosich, Sonoma State University: *A Proposal for the National Assessment of Higher-Order Thinking at the Community College, College, and University Levels.* (TM018018)

Reviewed by: Lorenz Boehm, Oakton Community College; Peter A. Facione, Santa Clara University; Ronald Hambleton, University of Massachusetts

James Ratcliff, Pennsylvania State University: *What Type of National Assessment Fits American Higher Education.* (TM018019)

Reviewed by: Nancy Beck, Educational Testing Service; Joan Herman, UCLA; Ted Marchese and Barbara Wright, AAHE Assessment Forum

Daniel Resnick and Natalie Peterson, University of Pittsburgh: *Evaluating Progress Toward Goal Five: A Report to the National Center for Education Statistics.* (TM018020)

Reviewed by: Nancy Beck, Educational Testing Service; Norman Frederiksen, Educational Testing Service; Joan Herman, UCLA

Donald Rock, Educational Testing Service: *Developnent of a Process to Assess Higher Order Thinking for College Graduates.* (TM018021)

Reviewed by: Lorenz Boehm, Oakton Community College; Joan Herman, UCLA; Michael Scriven, Pacific Graduate School of Psychology

Richard Venezky, University of Delaware: *Assessing Higher Order Thinking and Communication Skills: Literacy.* (TM018022)

Reviewed by: Robert Calfee, Stanford University; Margaret A. Miller, Virginia State Council of Higher Education; Michael Scriven, Pacific Graduate School of Psychology

Edward White, California State University at San Bernadino: *Assessing Higher Order Thinking and Communication Skills in College Graduates Through Writing.* (TM018023)

Reviewed by: Lorenz Boehm, Oakton Community College; John Chaffee, LaGuardia Community College; Peter A. Facione, Santa Clara University

Michael Scriven, Pacific Graduate School of Psychology: *Multiple-Rating Items.* (TM018024)

Contributed paper; no reviews.

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TABLE 1

WORKPLACE AND CITIZENSHIP SKILLS		
ACTIVITIES/TIME	SKILLS/USE	PHASES/TASKS
ED/NCES POSTSECONDARY ASSESSMENT (College Students and Graduates). Phase I 1/93-2/95 Phase II 8/95-8/98	SKILLS (Work & Citizenship): 1. Critical Thinking 2.Problem Solving 3. Oral Communication 4. Written Communication. USE OF FINDINGS: 1. Assist institutions, faculty and students to work more closely to identify and assess the achievement of needed work and citizenship skills. 2. Provide information to colleges and faculty on the barriers and/or incentives for the enhancement of the teaching/learning of these skills. 3. Report on the progress made on achieving National Goal 5.5 to the nation and its policymakers.	Phase I. Define skills and levels of proficiency. Tasks include: (a). Creation of a policy and technical work groups and identification of 50 paid reviewers. (b) Identification and review of initial listing of skills and levels of proficiency. (c) Revision of skills and levels of proficiency and identification of alternative approaches to the assessment of each. (d) Publication of revised listing of skills and attributes. Phase II. Implementation. Tasks include: (a) Develop the assessment instrumentation. (b) Field test instrumentation. (c) Develop sampling plan and data collection strategy. (d) collect data (e) Analyze data (f) prepare report(s) (g) Disseminate findings to larger community.

TABLE 2

WORKPLACE AND CITIZENSHIP SKILLS		
ACTIVITIES/TIME	SKILLS/USE	PHASES/TASKS
DOL/SCANS FOLLOW-UP (The Focus is on K-12 and Adults 21-25). Joint NCES/DOL contract. Phase I 7/92-12/93. Optional Phase II 1/94-6/95. Optional Phase III, 7/95-6/97 .	SKILLS (Work related only): Workplace Competencies: 1. Resource Use 2. Interpersonal Skills 3.Information Collection and Use 4. System Development and Use 5. Understanding and Use of Technology Foundation Skills Required: 1. Basic Skills 2. Thinking Skills 3. Personal Qualities. USE OF FINDINGS: 1. Determine national trends in work readiness among high school students and workers. 2. Establish external validity of new competency measures.	Phase I: Develop framework and select test items and pre-test. Tasks include: (a) Define objectives and develop assessment. framework. (b) Technical Work Group review appropriateness of work. (c) Develop at least 30 new test items for each of the competencies. (d) Identify assessment instrument(s). (e) Pretest instrument(s) on small groups. (f) Assist NCES develop OMB clearance package for NAEP and NALS for instrument (s). Phase II Establish internal validity and psychometric properties SCANS competency scales. Tasks include: (a) Plans for data collection for NALS and NAEP. (b) Analyze the data collected. (c) Assist OPM test FED workers. Phase III Administer SCANS measures in 1996 NALS. Tasks include: (a) Administer test (b) Analyze & report findings (c) Validation of SCANS measures

EXHIBIT 1

Workplace Know-How

The know-how identified by SCANS is made up of five competencies and a three-part foundation of skills and personal qualities that are needed for solid job performance. These include:

COMPETENCE: Effective workers can productively use:

- **Resources**—They know how to allocate time, money, materials, space, and staff.
- **Interpersonal skills**—They can work on teams, teach others, serve customers, lead, negotiate, and work well with people from culturally diverse backgrounds.
- **Information**—They can acquire and evaluate data, organize and maintain files, interpret and communicate, and use computers to process information.
- **Systems**—They understand social, organizational, and technological systems; they can monitor and correct performance; and they can design or improve systems.
- **Technology**—They can select equipment and tools, apply technology to specific tasks, and maintain and troubleshoot equipment.

FOUNDATION SKILLS—Competent workers in the high-performance workplace need:

- **Basic Skills**—reading, writing, arithmetic and mathematics, speaking, and listening.
- **Thinking Skills**—the ability to learn, to reason, to think creatively, to make decisions, and to solve problems.
- **Personal Qualities**—individual responsibility, self-esteem and self-management, sociability, and integrity.

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Levels of Proficiency

Rudimentary	*Basic*	*Intermediate*	*Adept*	*Advanced*
A. Reading				
ability to carry out simple, discrete reading tasks; e.g., read safety rules, simple directions, want ads, work orders, etc.	ability to understand specific or sequentially related information; e.g., obtain information from a directory, understand product labels, take written tests, read shop manuals and newspapers, etc.	ability to search for specific information, interrelated ideas, understand main theme or point, make generalizations; e.g., proofreading to delete errors, etc.	ability to find, understand, summarize and explain relatively complicated information, understand cause and effect relationships; e.g., interpret school policy, procedures and rules, interpret and learn from scientific or technical journals, etc.	ability to evaluate symbolism, multiple meanings and subtle influences in written material; e.g., interpret classic literature, political writing, etc.
B. Mathematics				
ability to perform simple addition and subtraction, multiplication and division; e.g., inventory number of items in stock, weigh produce and calculate price, total a bill for services, etc.	ability to use basic math skills to solve two step problems; e.g. make cost estimates for a construction project, etc.	ability to use algebra and geometry concepts to solve practical problems; e.g., calculate the number of yards of material needed for a pattern, calculate arrival times in transportation, etc.	ability to use more advanced math, such as calculus, probability and statistics, differential equations, to solve problems of design; e.g., design an electric circuit, projecting growth patterns in a geographical area, etc.	ability to create mathematical models of a process, ability to derive new theorems or methods of solution; e.g., derive and solve partial differential equations for a refining process, etc.
C. Writing				
ability to copy serial or model numbers, label materials or fill out a time card	ability to write standard English sentences; e.g., complete application for employment and record telephone messages, etc.	ability to write to inform, and express ideas accurately with correct spelling, quoting and phrasing; e.g., to construct letters and reports, write a business letter to relate actions taken at a meeting, etc.	ability to write reports, studies, documents, etc.; ability to write to convince; e.g., write a report recommending a change in policy, etc.	ability to write publishable material; e.g., journal articles, books, novels, etc.

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Levels of Proficiency

	Rudimentary	*Basic*	*Intermediate*	*Adept*	*Advanced*
D.	**Speaking and Listening**				
	ability to answer and ask questions and to follow two or three sequential instructions; e.g., ask an instructor for directions, repeat a message, answer simple oral exam questions, etc.	ability to verbalize one's understanding of instructions, to ask questions for clarification and demonstrate appropriate action; e.g., obtain and give telephone information order supplies, parts, materials, etc.	ability to organize and express ideas, directions and data in a logical sequence; e.g., describe how something works, explain to someone else how to perform a task, etc.	ability to convince or to sell, and identify/comprehend the main and subordinate ideas in discussions; e.g., express an idea to improve a process, justify an investment to management, persuade others in favor of a product, etc.	ability to conceive and develop ideas about a topic for the purpose of speaking to a group, to choose and organize related ideas and to present them in a compelling fashion
E.	**Computer Literacy**				
	basic understanding of how a computer works and common computer terminology; e.g., DOS, RAM, keyboard functions, etc.	ability to do an application; e.g., knowledge of simple software packages, etc.	ability to solve problems using multiple software packages; e.g., wordprocessing, spreadsheet, database, desktop publishing, etc.	ability to write a program, create a new functionality	ability to integrate programs to develop complete software systems, develop hardware
F.	**Reasoning and Problem Solving**				
	ability to understand and implement a given set procedure; e.g., inspect manufactured items for certain qualities and accept or reject, etc.	ability to select the best solution from clear alternatives after interpreting data and information; e.g., determine whether to use FAX, Express Mail, or regular mail to transmit information, etc.	ability to identify and express problems, develop solutions from alternative methods and procedures; e.g., increase output on assembly line, etc.	ability to abstract, generalize, develop concepts, understand cause and effect relationships when multiple variables impact the result; e.g., develop investment strategy (stocks, bonds, money market, etc.) based on conditions and trends	ability to develop totally unique solutions to multivariable and multiple outcome problems; e.g., develop new surgical procedure such as transplant surgery, etc.
G.	**Originality and Creativity**				
	performs tasks or other activities that do not deviate from set procedures	applies original thinking to the solution of problems, must devise or modify methods or process to solve specific problems	refines concepts or theories discovered or developed by others	creates new products or processes, validates concepts or theories	creates original concepts or theories that advance knowledge in technical or professional field and that can be used to develop new products or expand business

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